Winter 2022

Happy winter!

Now that winter is well established, I hope those of you that are cold weather enthusiasts are getting out there on skis, snowshoes, boards, skates, etc. Hopefully if you live where it is cold enough, some ice fishing is occurring as well! Spring and summer field seasons and the long busy days associated with them will be here soon enough. Please take care and be safe.

- Paul Kusnierz

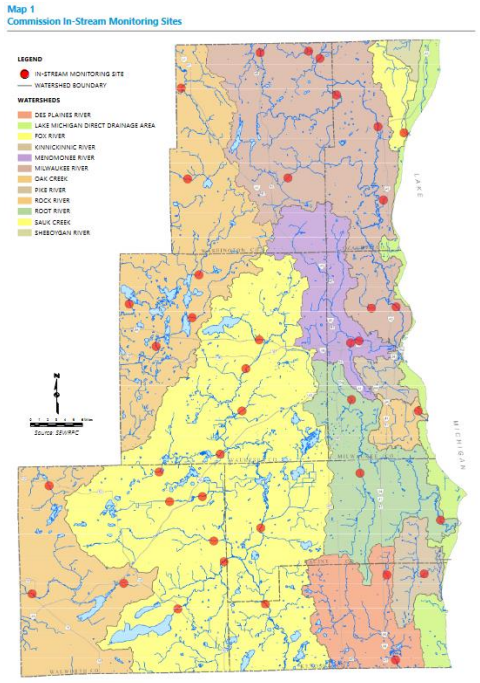
Communications Officer Election

We would like to fill the Communications Officer position by this coming summer. The Communications Officer is responsible for facilitating regular communication with the membership and maintaining accounts associated with the Section website, social media, and listserv. It is a great way to give back to the Section and will look good on your resume as well! If you would like to nominate someone or yourself, please let one of the officers know.

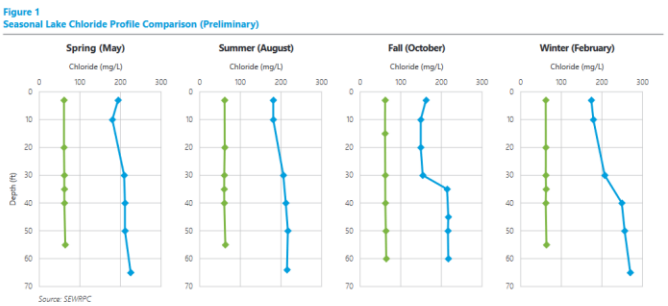
Understanding Chloride

The "season for salting" is here in the Midwest. My colleagues and I at the Southeastern Wisconsin Regional Planning Commission have initiated and been conducting "A Chloride Impact Study for the Southeastern Wisconsin Region." The Commission staff prepared a prospectus for a comprehensive study of the environmental impacts of the use of chloride on the surface water and groundwater resources of the region and can be found at https://www.sewrpc.org/SEWRPC/Environment/ChlorideImpactStudy.htm.

Work began on the study in summer 2017 and to date the Commission staff has focused on the region-wide monitoring effort outlined in the prospectus. This includes continuous monitoring for specific conductance at approximately 40 stream locations throughout the Region.



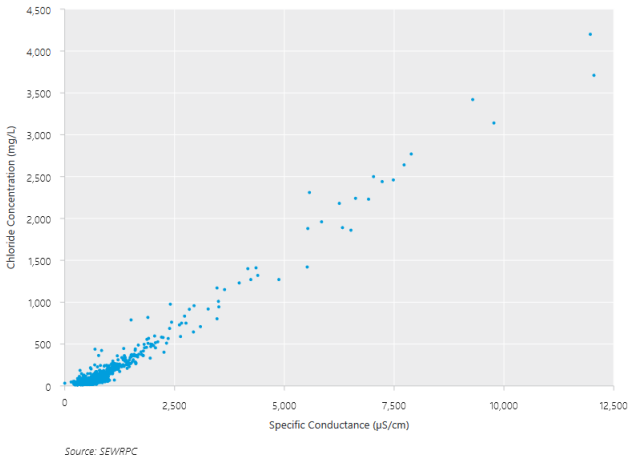
Following a detailed site selection process and in-stream monitoring equipment deployment, a three-year comprehensive data collection period began in October 2018 and concluded in October 2020. Additional data collection at selected sites continued into spring of 2021. Monthly grab samples were collected at each site, along with targeted event sampling, to obtain water quality data that include chloride concentrations. Additionally, quarterly sampling was performed at six lakes within the region, collecting temperature, specific conductance, and chloride data at various depths.



	Moose Lake	Little Muskego Lake
Maximum Chloride (mg/L)	66.3	270
Minimum Chloride (mg/L)	56.6	145

Previous studies have demonstrated that specific conductance is a good predictor of chloride concentration once a reliable relationship is established. Specific conductance, collected at 5-minute intervals at each monitoring site, is paired with the corresponding chloride concentration obtained from sampling and will be used to develop regression relationships.

Figure 2
Preliminary Paired Data: Specific Conductance and Chloride Concentrations at Commission Monitoring Sites (n = 1,022)



Source: SEWRPC

The best-fit chloride-specific conductance relationships will be used to estimate chloride concentrations based on the observed continuous specific conductance data. I would like to point out that we recorded a chloride concentration greater than 4,000 mg/L within the Milwaukee River watershed!

Now that the field sampling is completed, we are transitioning into the analysis phase and we will be developing several technical reports over the next year or so that will include:

1) Field Analyses for the Chloride Impact Study
2) Impacts of Chloride on the Natural and Built Environment
3) Chloride Conditions and Trends in SE WI
4) Regression Analysis for Conductance to Chlorides
5) Mass Balance Analysis for Chloride in SE WI
6) State of the Art of Chloride Management
7) Legal and Policy Considerations for the Management of Chloride

Our staff and resources are limited, but we have been developing an extensive library of relevant literature and research concerning chloride. Nonetheless, I would appreciate any additional information our members may be able to provide on any of the topics listed above with particular interest in the Impacts of Chloride on the Natural and Built Environment.

Although our communities have many water quality challenges, I cannot think of anything more urgent to address right now than chloride concentrations in our surface and groundwaters for human health as well as fish and wildlife.

- Thomas Slawski | PhD, Chief Biologist
tslawski@sewrpc.org

Acid Deposition Improvements at Great Smoky Mountains National Park

Acid deposition of nitrogen (N) and sulfur (S) has been a major environmental stressor upon the aquatic and terrestrial biota of Great Smoky Mountains National Park (GRSM) and the eastern United States for decades (Neff et al. 2008). Declines in stream pH as a result of acid deposition have led to the loss of at least six southern Appalachian Brook Trout populations across GRSM since the 1990s and eight streams (64 km) are listed as impaired on the Tennessee 303d list due to low stream pH. Major sources of N and S deposition within GRSM have been attributed to the burning of fossil fuels, automobiles, and agricultural practices. Recent GRSM long-term monitoring data indicates deposition of N and S have shown major improvements with wet deposition of sulfate and nitrate declining 50% and 82% since 1981; wet deposition of ammonium (NH4), sourced mainly from agricultural practices, has shown no change since 1981. Mean rainfall pH has increased from 4.3 in 1980 to 5.3 in 2021 representing a 10-fold improvement. Despite recent improvements in acid deposition across GRSM, soil and stream water chemistry at high elevations (>1,100 m) have been slow to respond due to decades of N and S loading, retention of N and S in soils, and mass export of base cations (i.e., Ca, Na, K, Mg) (Cai et al. 2010). Recent stream chemistry data

from a high elevation stream at Noland Divide (1,700 m) indicate declines in stream pH (6%), inorganic N (63%) and sulfate concentrations (21%) (Schwartz et al. 2021). High elevation soils at Noland Divide have recently switched from sulfate retention to sulfate export, indicating deposition reductions and increasing soil pH are recovering N and S saturated soils to pre-industrialization levels. Although these data trends are positive, recent modelling indicates, in order to improve stream pH to 6.0 by the year 2080 in the most sensitive GRSM streams, deposition reductions of 60% are needed from 2014 deposition levels to meet recovery goals (Fakhraei et al. 2016). Recent trends in deposition and soil and stream chemistry response indicate GRSM is on track to reach this recovery goal by 2080.

- Matt Kulp

References

Cai, M., J. S. Schwartz, R. B. Robinson, S. E. Moore, and M. A. Kulp. 2010. Long-term effects of acidic deposition on water quality in a high-elevation Great Smoky Mountains National Park Watershed: use of an ion input–output budget. Water, Air, & Soil Pollution, 209(1):143–156.

Fakhraei, H., C. T. Driscoll, J. R. Renfro, M. A. Kulp, T. F. Blett, P. F. Brewer, and J. S. Schwartz. 2016. Critical loads and exceedances for nitrogen and sulfur atmospheric deposition in Great Smoky Mountains National Park, United States. Ecosphere 7(10): e01466.

Neff, K. J., J. S. Schwartz, T. B. Henry, R. Bruce Robinson, S. E. Moore, and M. A. Kulp. 2009. Physiological stress in native southern brook trout during episodic stream acidification in the Great Smoky Mountains National Park. Archives of Environmental Contamination and Toxicology 57(2):366–376.

Schwartz, J., M. Kulp, and J. Renfro. 2021. Throughfall deposition chemistry in Great Smoky Mtns. National Park:
Long-term trends and effects on stream water quality. Presentation at NADP Online Fall Meeting and Scientific Symposium.

Rain, Rain Go Away…Understanding Stormwater Systems

A stormwater system is a tool for managing the runoff from rainfall. When rainwater lands on rooftops, parking lots, streets, driveways and other surfaces that water cannot penetrate, the runoff flows into storm drains, swales, or ditches located around your property and neighborhood. These storm drains, swales, and ditches carry the runoff into stormwater ponds. A stormwater pond is specifically designed to help prevent flooding and remove pollutants from the water before it can drain into the groundwater or into streams, rivers, lakes, wetlands, or the ocean. Your stormwater pond might be located near your backyard, down the street or on a nearby property.

In Florida, the responsibility for permitting most stormwater systems rests with water management districts. After developers complete construction of permitted systems in residential areas, the permit and the legal responsibility for maintaining these systems is typically passed on to a homeowners or condominium association. This transfers the upkeep and maintenance of the system and becomes the responsibility of the association, not the developer.

Homeowner associations, property managers, and residents play a vital role in managing the drainage systems in their area. By being familiar with the components in communities, residents and property managers can become active in helping to prevent flooding and pooling water. Drainage systems in your neighborhood should be inspected regularly, checking to see if trash, dead vegetation, and sediments are being removed. Properly maintaining a stormwater system is important as the cost for emergency repairs can be expensive!

- Wendy Shaw, Allstate Resource Management

Spokane Meeting Dam and Culvert Removal Symposium

The Water Quality Section anticipates co-sponsoring a symposium tentatively titled “Pros and Cons of Dam and Culvert Removals” along with the Western Division, Bioengineering Section, Fish Habitat Section, and Invasive and Introduced Fish Section at the annual meeting in Spokane, WA. It is being organized by Bob Hughes, Gary Whalen, Marybeth Brey, Helen Neville, Laura Wildman, Alison Coulter, Kevin Irons, and Nathan Lederman. Water Quality Section members are encouraged to submit presentations. The abstract is as follows:

Dams and other engineered barriers (e.g., poorly designed culverts, weirs, or diversions) have truncated the ranges of many diadromous fish populations in regulated rivers and limited the distribution of fishes in most smaller rivers and streams in the USA and many globally. Barriers have interrupted metapopulation dynamics of resident fish and mussels and disrupted migrations. Many of these barriers are reaching their life expectancies and threaten human health and safety if intervention does not occur. Over recent decades, thousands of these dams have been removed, and even more culverts have been retrofitted, across the USA, Canada, and Europe. However, those same barriers could have also been inhibiting or slowing the spread of invasive non-native species or provided key locations for management actions. Efforts to restore connectivity and retrofit/remove aging infrastructure in rivers and streams continues; for example, new funding for culvert replacement and dam removal was recently passed in the US federal infrastructure bill. Can achieving desired benefits to native fishes through improved connectivity be reached while controlling invasive non-native species spread? Symposium presentations are sought that document the effects of dams on fish populations before and after removal, fish metapopulation dynamics and demographics affected by dams, water quality changes, sediment redistribution and contaminant levels after building or removing dams, impacts of removal or addition of barriers to invasive species spread, and decision frameworks for deciding where to increase the permeability of barriers to benefit aquatic biota.

Special Issue, 'Renewable Energy and Biological conservation in a Changing World'

This special issue appears in the journal Biological Conservation and includes several papers about hydropower and an overview paper with the same title. It can be found at: https://www.sciencedirect.com/journal/biological-conservation/special-issue/10B98GTFHJ3

- Yetta Jager

Recent Member Publications

Bradley, P. M., M. A. Kulp, B. J. Huffman, K. M. Romanok, K. L. Smalling, S. E. Breitmeyer, J. M. Clark, and C. A. Journey. 2021. Reconnaissance of cumulative risk of pesticides and pharmaceuticals in Great Smoky Mountains National Park streams. Science of The Total Environment 781:146711.

Feio, M.J., R.M. Hughes, M. Callisto, S.J. Nichols, O.N. Odume, B.R. Quintella, M. Kuemmerlen, F.C. Aguiar, S. Almeida, P. Alonso-EguiaLis, F.O. Arimoro, F.J. Dyer, J.S. Harding, S. Jang, P.R. Kaufmann, S. Lee, J. Li, D.R. Macedo, A. Mendes, N. Mercado-Silva, W. Monk, K. Nakamura, C.G. Ndiritu, R. Ogden, M. Peat, T.B. Reynoldson, B. Rios-Touma, P. Segurado, and A.G. Yates. 2021. The biological assessment and rehabilitation of the world’s rivers: an overview. Water 13, 371, DOI:10.3390/w13030371.

Herlihy, A.T., R.M. Hughes and W.J. Gerth. 2021. Longitudinal patterns in river ecological indicators in the Pacific Northwest: implications for river research, monitoring & management. River Research & Applications. DOI:10.1002/rra.3916.

Hughes, R.M., M. Zeigler, S. Stringer, G. Linam, J. Flotemersch, S. Joseph, B. Jessup, J. Jacobi, L. Guevara, R. Cook, P. Bradley, and K. Barrios. 2022. Biological assessment of western USA sand-bed rivers based on modeling historical and current fish and macroinvertebrate data. River Research & Applications. DOI:10.1002/rra/3929.

Hughes, R.M. and R.L. Vadas. 2021. Agricultural effects on streams and rivers: a western USA focus. Water 13. DOI:10.3390/w13141901.

Hughes, R.M., A.T. Herlihy, and D.V. Peck. 2021. Sampling effort for estimating fish species richness in western USA river sites. Limnologica. DOI:10.1016/j.limno.2021.125859.

Jager, H. I., R. A. Efroymson, and R. A. McManamay. 2021. Renewable energy and biological conservation in a changing world. Biological Conservation 263:109354.

Kreig, J. A., E. Parish, and H. I. Jager. 2021. Growing grasses in unprofitable areas of US Midwest croplands could increase species richness. Biological Conservation 261:109289.

Malone, E. W., J. S. Perkin, W. Keith Gibbs, M. Padgett, M. Kulp, and S. E. Moore. 2022. High and dry in days gone by: Life-history theory predicts Appalachian mountain stream fish assemblage transformation during historical drought. Ecology of Freshwater Fish 31(1):29–44.

Martins, I., D.R. Macedo, R.M. Hughes, and M. Callisto. 2021. Major risks to aquatic biotic condition in a Neotropical Savanna river basin. River Research & Applications 37:858–868.

Martins, R.T., J. Brito, K. Dias-Silva, C.G. Leal, R.P. Leitao, V.C. Oliveira, J.M.B. de Oliveira-Junior, S.F.B. Ferraz, F.R. de Paula, F.O. Roque, N. Hamada, L. Juen, J.L. Nessimian, P.S. Pompeu, J. Zuanon, and R.M. Hughes. 2021. Low forest-loss thresholds threaten Amazonian fish and macroinvertebrate assemblage integrity. Ecological Indicators. DOI:10.1016/j.ecolind.2021.107773.

McManamay, R. A., C. R. Vernon, and H. I. Jager. 2021. Global biodiversity implications of alternative electrification strategies under the shared socioeconomic pathways. Biological Conservation 260:109234.

Pompeu, P.S, D.R. Carvalho, C.G. Leal, R.P. Leitão, C.B.M. Alves, D.F. Braga, M.A. Castro, N.T. Junqueira, J. Zuanon, and R.M. Hughes. 2021. Sampling efforts for determining fish species richness in megadiverse tropical regions. Environmental Biology of Fishes DOI10.1007/s10641-021-01184-7.

Traczyk, R., V.B. Meyer-Rochow, and R.M. Hughes. 2021. Age determination in the icefish Pseudochaenichthys georgianus (Channichthyidae) based on multiple methods using otoliths. Aquatic Biology 30:1–18.

In Closing

Thank you to everyone who contributed to this newsletter. Your contributions are key to how this newsletter looks from issue to issue. Please send newsletter topic suggestions, news articles, or your own articles whenever you think of it. I'll do my best to work in what I can! As a reminder, there is a section webpage (https://waterquality.fisheries.org/) and Facebook Page (www.facebook.com/AFS-Water-Quality-Section-369954383031160/) available for your use. I welcome your feedback on both. Finally, planning for the annual meeting in Spokane, WA is well underway (https://afsannualmeeting.fisheries.org/). **The date to submit symposium has been extended until February 18th** (https://afsannualmeeting.fisheries.org/call-for-symposium-proposals/?utm_source=mailpoet&utm_medium=email&utm_campaign=Newsletter+02-02-2022). I hope that you'll consider attending the meeting and contributing by planning a symposium, giving a presentation, or volunteering.

See you next issue,

Paul Kusnierz
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